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Analysis of New Source Review (NSR) Permitting Experience: Executive Summary

TRW, Inc.
Research Triangle Park, NC

Prepared for

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16. Abstracts

This report surveys 285 Prevention of Significant Deterioration (PSD) permits issued between 1978 and 1980 and analyzes permit processing times, the stringency of permit limitations, the impact of PSD "increment," and other aspects of the PSD program.

17. Key Words and Document Analysis. 17a. Descriptors

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EXECUTIVE SUMMARY

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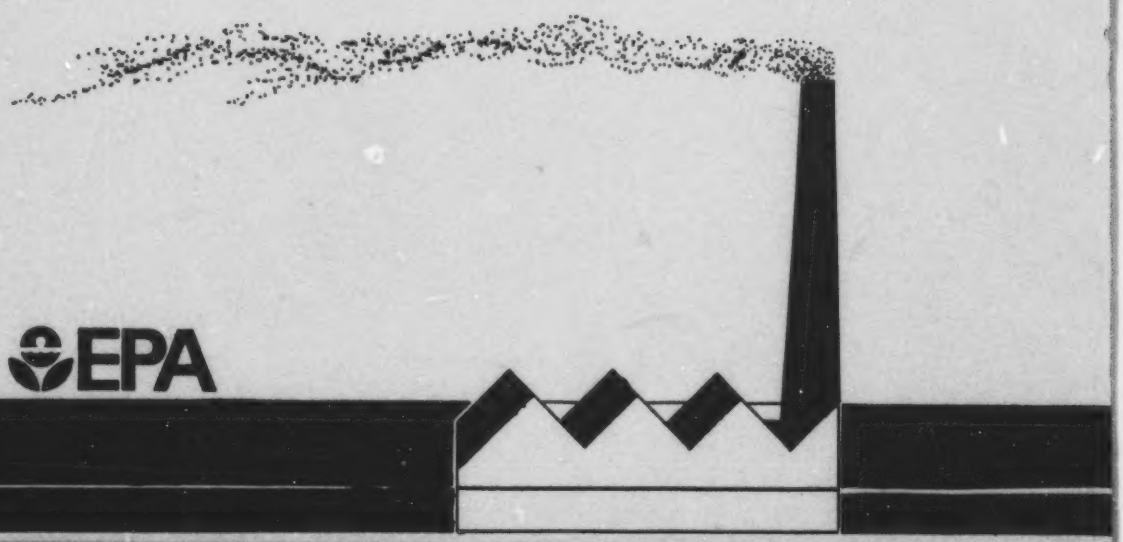

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ANALYSIS OF NEW SOURCE REVIEW (NSR)

PERMITTING EXPERIENCE

EXECUTIVE SUMMARY

U.S. ENVIRONMENTAL PROTECTION AGENCY
Air Economic Branch
Economic Division
Office of Planning and Resource Management
Washington, D.C.

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This report was prepared for the Air Economics Branch, Economics Analysis Division, Office of Policy and Resource Management, U.S. Environmental Protection Agency, Washington, D.C.; by TRW Inc., Environmental Division, under Contract Number 68-02-3174. The EPA Project Officer was Mr. Alex Cristofaro.

Data and analyses presented in this report, in many cases, were extracted from projects performed by TRW under Contract Number 68-02-3515, for which Mr. James Weigold, and Mr. Mike Trutna, Office of Air Quality Planning and Standards, Durham, North Carolina, were the EPA Project Officers. In addition, the analyses for Section 3 of this report, Permit Application Processing Times, were performed by TRW under separate Contract No. 68-01-5838, for which Mr. Scott Flamm, Office of Policy and Resource Management was the EPA Project Officer.

The TRW Project Manager was Mr. L. Hayes. Principal investigators were Messrs. W. Warren-Hicks, L. Bravo, J. Avery, J. Shumaker, P. Gunthorpe, and Ms. D. Wells.

NOTICE

This report is divided into three main sections:

- Executive Summary;
- Full Report; and
- Appendices.

The Executive Summary is a brief summary of the highlights of the report findings and, in addition to being the first section (1.0) of this report, it has also been printed and bound separately.

The body of the report presents all analyses and explanations are provided, as necessary, to allow the reader to better understand the significance of the results. Descriptions of analytical methods used and greater details of the data are contained in the respective appendices: A through G.

The subsections of the Executive Summary correspond to the sections of the full report. For instance, Subsection 1.2 of the Executive Summary and Section 2.0 of the report both deal with descriptions of the data base; Subsection 1.3 of the Executive Summary and Section 3.0 of the report both deal with permit application processing times, and so on.

TABLE OF CONTENTS

EXECUTIVE SUMMARY

	Page
1.0 EXECUTIVE SUMMARY	1
1.1 INTRODUCTION	1
Background	1
Project Objectives	2
1.2 DATA BASE OF PSD PERMIT APPLICATIONS	2
Data Base Source Types	2
Data Base Emissions Summary	2
PSD Application Submittals	5
1.3 PERMIT APPLICATION PROCESSING TIMES	5
Summary of PSD Permit Processing Times	5
Total Processing Time	5
Application Completeness	8
Permit Processing Time From Receipt of Complete Application	11
Effect of Source Type and Size on Processing Times	11
Effect of Pre-Application Meetings on Processing Times	11
Permit Processing Times for Applications Subject to Both PSD and Non-Attainment Review	11
1.4 PSD AND NON-ATTAINMENT REVIEW APPLICABILITY	14
Emissions Subject to Review	14
Permit Applications Eliminated From Review at Various Thresholds	14
1.5 ANALYSIS OF BACT AND LAER ASSOCIATED WITH FINAL PERMIT EMISSIONS LIMITATIONS	18
Technology Reviews	18
Effects of NSPS and NESHAPS on BACT and LAER	18
Emission Units	18
Allowable Emissions	21
BACT vs. LAER	23
Effect of Emission Unit Size on BACT-Permitted Emissions and Emissions Reductions Beyond NSPS	29

TABLE OF CONTENTS

(Continued)

		Page
	Emission Reductions From Proposed BACT Emission Levels	35
	Effect of PSD on Allowable Emissions	35
1.6	ANALYSIS OF AIR QUALITY IMPACTS	37
	Frequency of Air Quality (A/Q) Analyses	37
	Effects of Allowable PSD Increment Constraints	38
	Effects of Constraints Caused by National Ambient Air Quality Standards (NAAQS)	39
	Effect of A/Q Constraints on Emissions Reductions Beyond NSPS	40
1.7	MISCELLANEOUS ASSOCIATED ANALYSES	40
	Effect of Class I Allowable SO_2 Increment on Power Plant Siting	40
	Effect of Alternative Class I Increment System on Emissions Near Class I Areas	43
	Cost to Prepare a PSD Application	43

1.0 EXECUTIVE SUMMARY

1.1 INTRODUCTION

Background

Pursuant to the Clean Air Act Amendments of 1977 EPA, in 1978, revised its New Source Review (NSR) regulations. The revised Prevention of Significant Deterioration (PSD) regulations were more extensive than their predecessors in that many more sources were subject to PSD requirements. The NSR regulations were again revised in 1980 as a result of litigation. This report deals with a sample of the pre-construction permits issued under EPA's post-1977 NSR regulations. In the years 1978, 1979 and 1980, EPA issued approximately 1100 NSR permits (about 370 per year, average) consisting mostly of PSD or combination PSD/non-attainment permits.

The data and information contained in this report summarize results of a study directed at assessing the experience of EPA's New Source Review (NSR) Program. Information extracted from Prevention of Significant Deterioration (PSD) and non-attainment permit files augmented by data obtained from company representatives have been compiled, analyzed and interpreted. An automated (computer) data base has been constructed containing relevant data for each of more than 285 PSD and non-attainment permits issued since 1978.

The data base permits were subject to two different PSD Regulations (1978 and 1980) and one "interim" applicability criterion that being the post-Alabama Power "stay" of PSD Regulations in effect between February 5 and August 7, 1980. These regulations are complex and contain different regulatory requirements. An understanding of these regulations is extremely helpful in reading and interpreting this report. For that purpose, a brief description of the PSD and non-attainment regulations and the major differences between the 1978 and 1980 versions is provided in Appendix A of the full report.

Project Objectives

The primary objective of this project was to produce data that characterize recent experience with implementation of EPA's NSR Regulations. The data extracted and compiled was for the purpose of representing a cross-section of PSD and non-attainment permits issued pursuant to the Clean Air Act Amendment of 1977. The results described in this report are not intended as an assessment of the effectiveness (or lack thereof) of the NSR program. The analyses performed and the presentation of results are fashioned to allow the reader to formulate his or her own opinions.

Stringent quality control procedures were used for each step of this project. Accuracy checks were made by attempting to arrive at the same value by two or more independent methods. If results of two methods differed by more than 3%, investigations of the cause(s) were conducted until the difference became less than 3%.

1.2 DATA BASE OF PSD PERMIT APPLICATIONS

Data Base Source Types

The data base consists of 285 PSD applications sampled from the ten EPA regions. Table 1-1 presents a summary of the data base industrial source categories included in the sample by EPA region. The data base applications are grouped into the "named" 28 PSD sources and "other" PSD sources. The "named" 28 sources are subject to a 100 tons/year major source threshold as defined in the PSD regulations. The "other" source categories are subject to a 250 ton per year major source threshold.

Petrochemical and petroleum related sources (108) such as refineries, terminals, compressor stations, etc. constitute 38% of the data base followed by electric utilities (14%).

Data Base Emissions Summary

Table 1-2 presents an emissions summary of PM, SO_2, NO_x, CO and VOC emissions from all data base applications. The emissions presented are the "net emissions changes" and "BACT and LAER permitted emissions". The net emissions changes of a pollutant are calculated as the difference between the gross increases and gross decreases of the pollutant for all data base applications. Most emissions limitations in PSD permits are a result of case-by-case application of either Best Available Control Technology (BACT) for "attainment" pollutants or Lowest Achievable Emission Rate (LAER) for

Table 1-1. DATA BASE PSD APPLICATIONS BY EPA REGION AND SOURCE CATEGORY

Source Category	EPA REGION I	II	III	IV	V	VI	VII	VIII	IX	X	Total
A. Named 28 PSD Sources											
Electric plants with greater than 250 MMBtu/hr heat input	1	1	4	6	5	4	5	5	5	3	39
Coal cleaning plants (with thermal dryers)	0	0	0	0	2	0	0	0	0	0	2
Kraft pulp mills	2	1	1	6	0	1	0	0	0	3	14
Portland cement plants	0	0	0	0	0	2	0	3	0	0	5
Smelters	0	3	2	3	1	0	1	0	0	1	11
Non-metallic mineral process plants	0	0	0	5	2	1	0	0	0	1	9
Carbon black plants	0	0	0	0	0	2	0	0	1	0	3
Chemical plants	1	8	6	9	3	7	1	0	0	1	36
Petroleum refineries	0	1	2	3	0	6	3	1	7	3	26
Other - municipal incinerator, coke oven, fuel conversion, secondary metal, petroleum transfer and glass fiber plants	1	0	2	0	4	1	1	0	0	1	10
Subtotal	5	14	17	32	17	24	11	9	13	13	155
B. Other PSD Sources											
Mining operations	1	3	1	0	1	0	0	2	1	0	9
Asphalt production plants	3	5	4	0	2	0	0	1	1	0	16
Natural gas and crude oil pumping stations	0	0	0	1	4	12	2	11	2	11	43
Natural gas processing plants	0	0	0	0	0	0	0	2	0	1	3
Lumber and wood products manufacturing	4	0	0	1	1	1	0	0	0	1	8
Automotive part manufacturing	0	0	0	1	4	0	2	0	0	0	7
Food processing	0	1	0	4	0	0	0	0	1	0	6
Brewery	0	1	2	0	1	1	0	0	0	0	5
Glass manufacturing	0	0	1	0	1	1	0	0	1	0	4
Municipal incinerators capable of charging less than 250 MMBtu/hr heat input	3	1	0	1	0	0	0	0	0	0	5
Miscellaneous manufacturing/production - computers, electrodes, textiles, fertilizer, salt, kaolin, geothermal power, printing	0	4	1	3	1	0	0	0	2	0	11
Rubber and plastic production plants	0	1	0	2	0	0	0	0	0	0	3
Other - including military bases, laboratories	1	0	4	0	0	0	0	1	2	2	10
Subtotal	12	16	13	13	15	15	4	17	10	15	130
Grand Total	17	30	30	45	32	39	15	26	23	28	285

Table 1-2. EMISSIONS SUMMARY OF PM, SO_2, NO_x, CO and VOC EMISSIONS FROM ALL DATA BASE APPLICATIONS

Pollutant	Net Emissions Changes (tons/year)	BACT and LAER Permitted Emissions
PM	57,000	57,000
SO_2	722,000	777,000
NO_x	709,000	713,000
CO	-107,000[a]	162,000
VOC	-13,000[b]	16,000

[a]This value includes emissions reductions of 299,000 tons/year of CO from two carbon black plants.

[b]This value includes emission reductions of 22,000 tons/year of VOC from one carbon black plant and one kraft pulp mill.

non-attainment pollutants. Those data base emissions that resulted from either BACT or LAER review are presented in the table as "BACT and LAER permitted emissions". In the case of CO, large reductions at two carbon black plants resulting from combustion of process gas are greater than the CO increases in the remainder of the data base. Similarly, VOC emissions indicate a net decrease for the data base. However, many PSD permits supply only estimated VOC emissions and in some cases, VOC emissions were not quantified at all. Therefore, VOC emissions data are not accurate and caution should be used in assessing this data.

PSD Application Submittals

Figure 1-1 shows a chronology of data base PSD applications by submittal date. It appears that "surges" of PSD application submittals occurred at times of actual or anticipated changes in PSD requirements. The first surge occurred just prior to the August 7, 1978 expiration of the monitoring exemption. The second and third surges occurred just prior to the Alabama Power decision and expiration of the "stay" of PSD regulations, respectively.

Overall, the data base consists of 33% new major sources and 67% major modifications. Of the 285 data base applications, 215 were reviewed under the 1978 regulations and 70 were subject to the 1980 (post-Alabama Power) regulations.

1.3 PERMIT APPLICATION PROCESSING TIMES

Summary of PSD Permit Processing Times

Total Processing Time. PSD permit processing times varied widely among data base applications. The time between initial application submittal and permit issuance ranged from 1.4 to 51.3 months.

Table 1-3 summarizes by EPA region the total processing time (from initial application submittal to permit issuance) of all data base applications. By EPA region, processing times averaged 11.0 months and ranged from 8.0 to 14.6 months. As shown on Table 1-3, the average processing time by affiliation of the application reviewer (EPA, State or local agency, or contractor) varied between 10.5 months for EPA personnel to 12.9 months for contractors. Contractors were used by EPA and State agencies to assist in reviewing and processing NSR permit applications. Based on the limited amount of data for contractor and State agency

Figure 1-1.

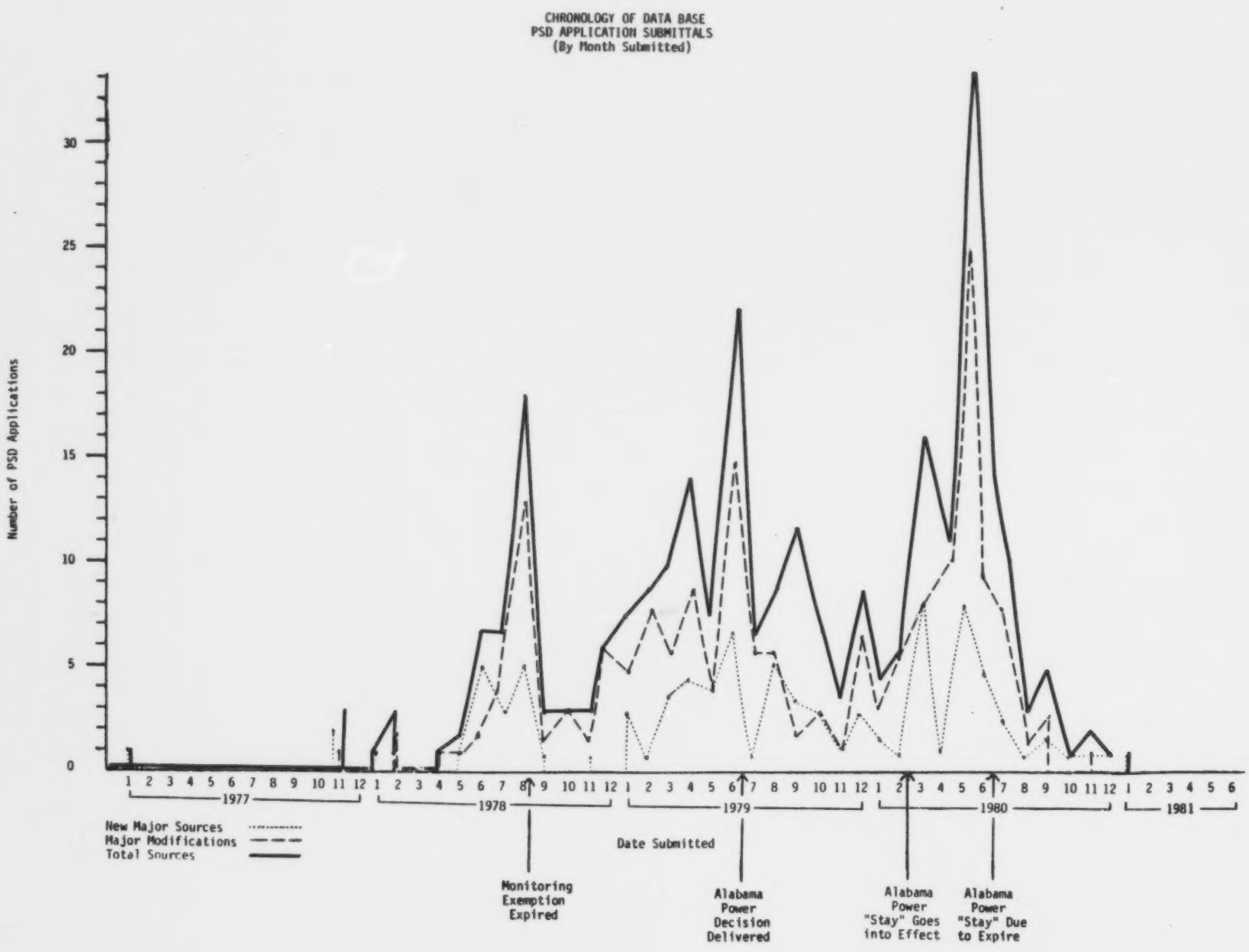

CHRONOLOGY OF DATA BASE
PSD APPLICATION SUBMITTALS
(By Month Submitted)
Number of PSD Applications
0
5
10
15
20
25
30
1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6
1977
1978
1979
1980
1981
New Major Sources
Major Modifications
Total Sources
Date Submitted
Monitoring Exemption Expired
Alabama Power Decision Delivered
Alabama Power "Stay" Goes into Effect
Alabama Power "Stay" Due to Expire

Table 1-3. SUMMARY OF PSD PERMIT PROCESSING TIME (INITIAL APPLICATION SUBMITTAL TO PERMIT ISSUANCE) BY EPA REGION AND APPLICATION REVIEWER

EPA Region	PSD Application Reviewer: EPA Personnel — No. of Applications Reviewed	EPA Personnel — Average Processing Time (months)	State Agency Personnel — No. of Applications Reviewed	State Agency Personnel — Average Processing Time (months)	Contractors — No. of Applications Reviewed	Contractors — Average Processing Time (months)	Total Permits Issued	Overall Average Processing Time (months)	Range of Processing Time (months)
1	17	8.0	0	N/A	0	N/A	17	8.0	2.9 - 15.3
2	30	9.8	0	N/A	0	N/A	30	9.8	1.4 - 20.8
3	29	11.6	0	N/A	1	6.5	30	11.4	3.6 - 37.7
4	1	4.6	33	10.3	11	13.9	45	11.1	2.9 - 32.1
5	32	11.9	0	N/A	0	N/A	32	11.9	4.9 - 24.6
6	0	N/A	0	N/A	39	13.9	39	12.4	5.7 - 37.5
7	15	14.6	0	N/A	0	N/A	15	14.6	2.2 - 31.6
8	24	8.9	0	N/A	2	22.8	26	9.9	3.5 - 27.5
9	21	10.9	1	26.9	1	9.3	23	11.5	2.6 - 51.3
10	28	9.4	0	N/A	0	N/A	28	9.4	3.0 - 19.5
TOTAL	197		34		54		285		
OVERALL AVERAGE PROCESSING TIME (MONTHS)		10.5		10.8		12.9		11.0	
RANGE OF PROCESSING TIME (MONTHS)		1.4 - 51.3		2.9 - 32.1		3.8 - 37.5			1.4 - 51.3

reviewers, it does not appear that processing times were greatly influenced by reviewer affiliation.

As can be determined from Figure 1-2, 25% of the data base permits were processed within 6 months; 68% within one year and 88% within 18 months from the time of initial submittal. It must be recognized that the sampling procedure itself created a potential bias that may cause results of processing time analyses to be misleading when attempting to apply these results to all NSR permits. Permits were selected for inclusion based on reverse chronological order of permit issuance. Therefore, permit applications submitted early and processed quickly and applications submitted late and not processed quickly would not have been selected. This potential bias is further discussed in Section 3.0 of the report.

Application Completeness. Sixty-six (23%) data base applications were deemed officially "complete" upon initial application submittal. The remainder (219) were required to submit additional information for this determination. In a few cases, this required more than two years from the date of initial submittal. Overall, it took an average of 3.7 months from initial submittal to submittal of a "complete" application.

Figure 1-3 shows the distribution of data base applications by the time between initial submittal and determination of "completeness."

As shown below, the fraction of PSD applications that were deemed complete upon initial submittal varied from 0% of the applications in EPA Region I to 52% in Region IX.

EPA Region	Total Number of Data Base Applications in Region	Applications Determined "Complete" Upon Initial Submittal	
		Number	% in Region
I	17	0	0
II	30	11	37
III	30	1	3
IV	45	18	40
V	32	1	3
VI	39	5	13
VII	15	1	7
VIII	26	10	37
IX	23	12	52
X	28	7	26

FIGURE 1-2. DISTRIBUTION OF PERMIT PROCESSING TIMES BY 6 MONTH INTERVALS.

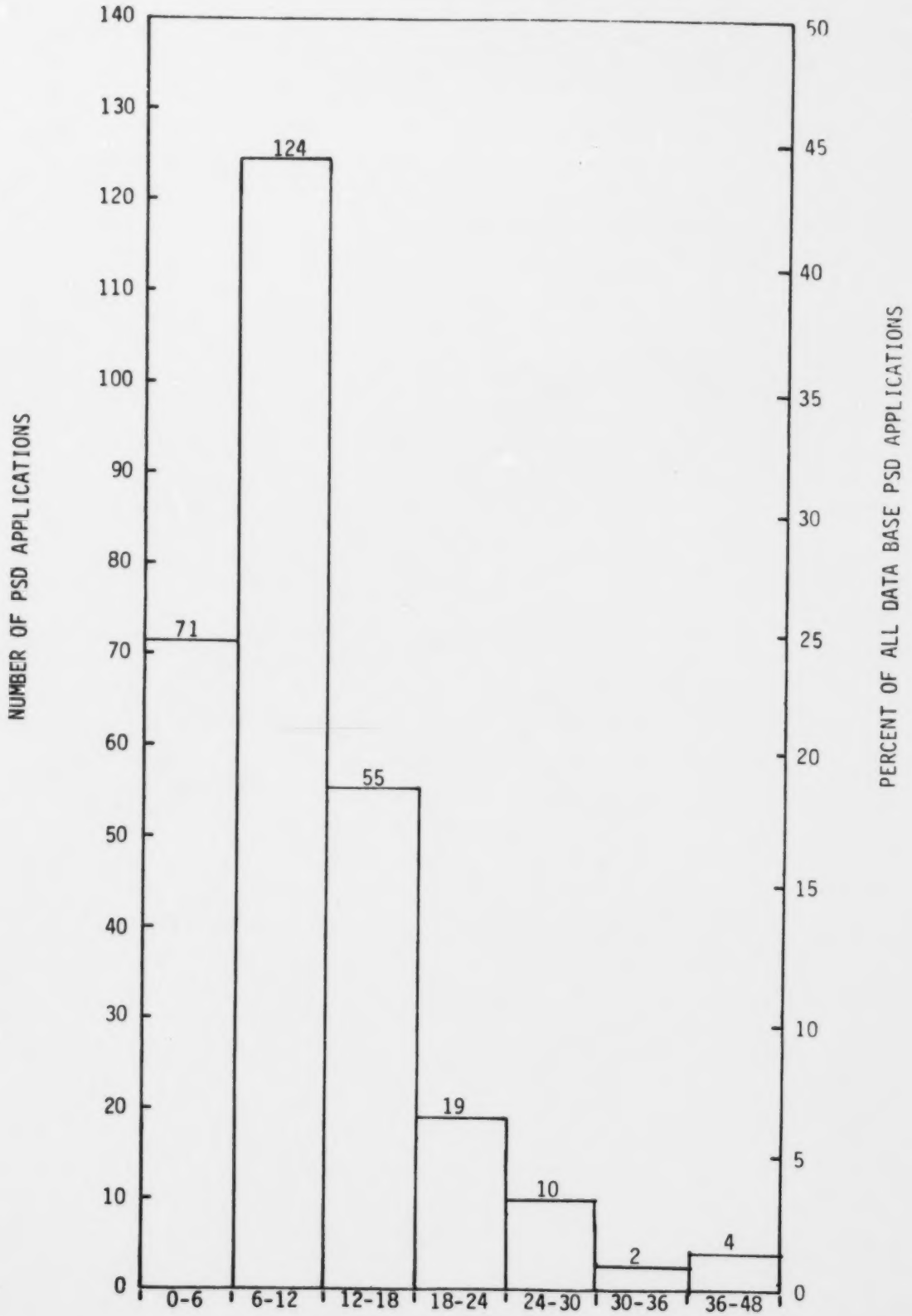
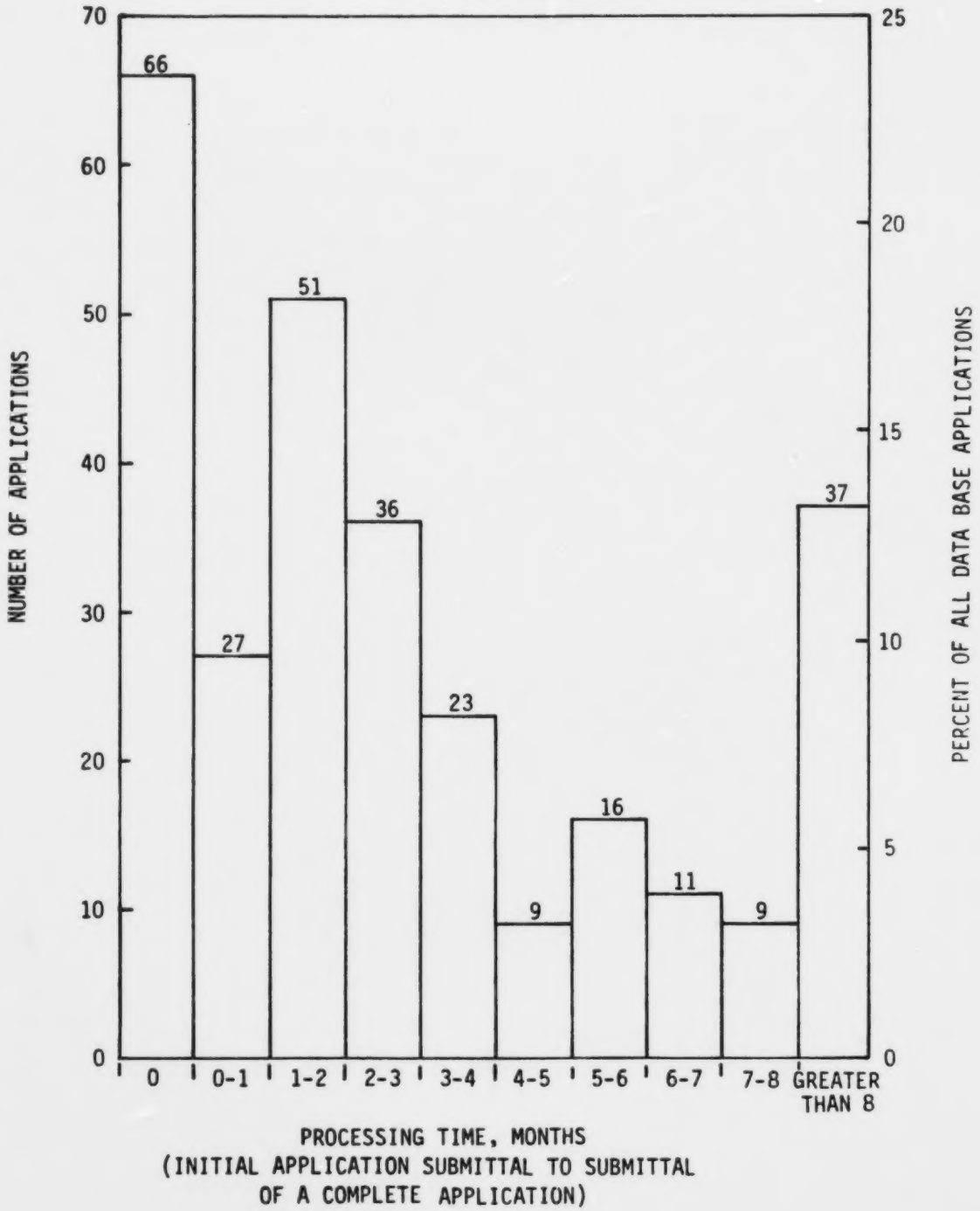


FIGURE 1-3. DISTRIBUTION OF THE PROCESSING TIME BETWEEN INITIAL APPLICATION SUBMITTAL AND SUBMITTAL OF A COMPLETE APPLICATION BY 1 MONTH INTERVALS.



Permit Processing Time From Receipt of Complete Application. The average permit processing time from date of "completeness" to final permit issuance was 7.1 months. By EPA region this average ranged from 5.3 to 9.3 months. As shown in Figure 1-3, almost 90% of the data base applications were processed within one year of submittal of a "complete" application.

Effect of Source Type and Size on Processing Times

From date of initial submittal, utility power plants applications took considerably longer to process than all other source types combined. About 50% of non-utility applications were processed (total time) in less than nine months whereas only 16% of utility applications were processed within that time. Furthermore, almost 60% of utility applications required more than one year to process (total time) whereas only 27% of the non-utility sources required more than one year.

It appears that applications for major modifications required slightly more processing time than those for new major sources. An analysis showed that for major modifications, a direct relationship exists between the length of application processing time and the amounts of pollutants increased (tons/year). This same relationship was not found to be true for new major sources.

Effect of Pre-Application Meetings on Processing Times

For applications submitted in 1978, 1979 and 1980, those that were preceded by meetings between the applicant and the reviewing authority appeared to have experienced shorter total permit processing times than those that did not. Table 1-4 shows that this difference averaged 7.5 months in the last half of 1978 and .8 months in the first half of 1980. The table also shows this difference to gradually disappear in 1980. This may indicate that pre-application contacts were beneficial at the inception of the program, but as people became more aware of the regulations and procedures, pre-application contact diminished in value as far as processing times are concerned. A survey of EPA regional office files shows that about 30% of the data base permits involved pre-application contact between the applicant and the reviewing authority.

Permit Processing Times for Applications Subject to Both PSD and Non-Attainment Review

Twenty-three (23) applications were found to be subject to simultaneous PSD and non-attainment review. For these 24 permits, the time required to obtain both the PSD and non-attainment permits ranged from 3.7 to 37 months and averaged 14.4 months from date of initial submittal to permit issuance.

FIGURE 1-3. DISTRIBUTION OF THE PROCESSING TIME BETWEEN SUBMITTAL OF A COMPLETE APPLICATION AND PERMIT ISSUANCE BY 6 MONTH INTERVALS.

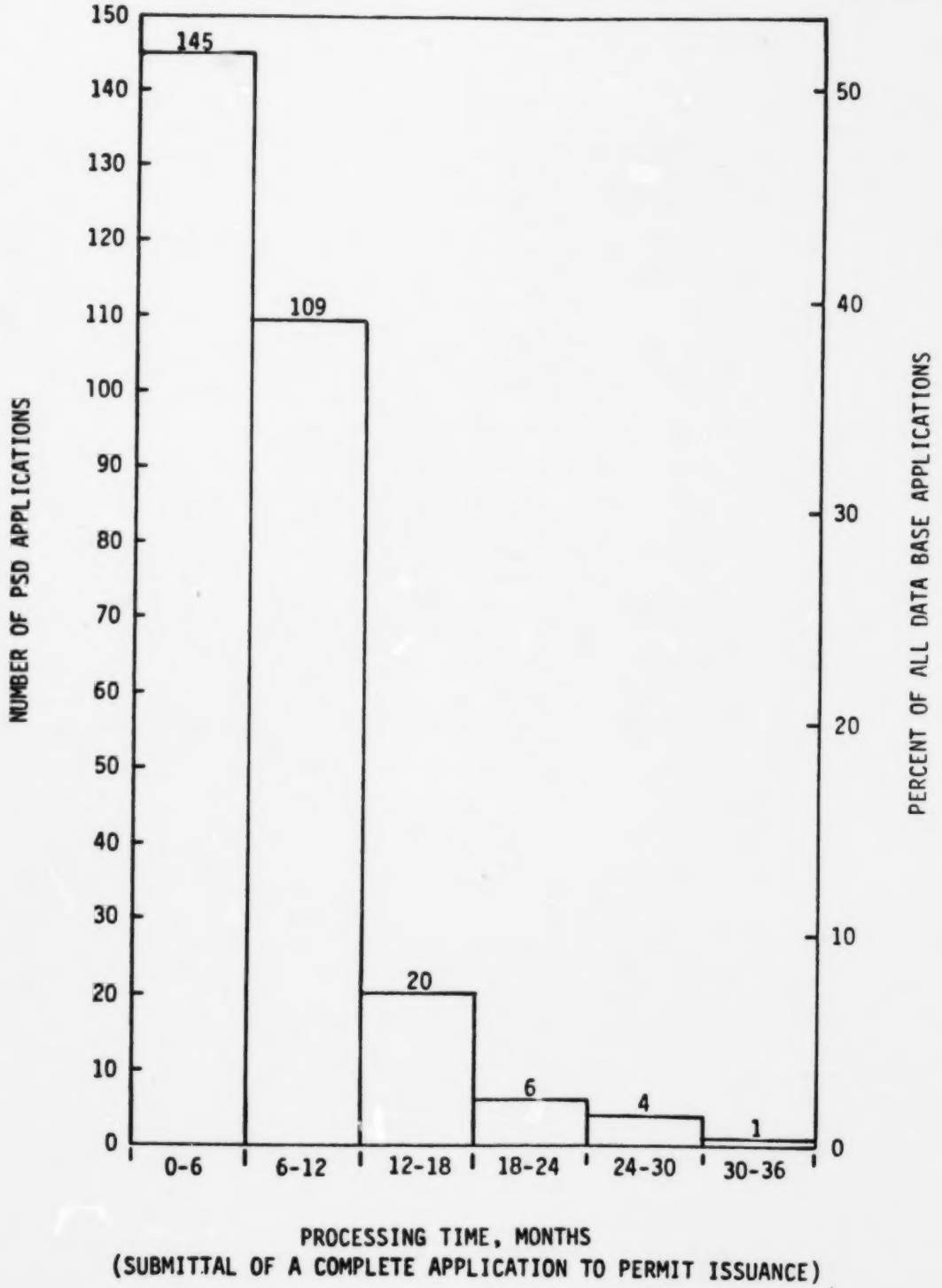


Table 1-4. COMPARISON OF AVERAGE PERMIT PROCESSING TIMES FOR PSD PERMIT APPLICATIONS WITH AND WITHOUT PRE-APPLICATION MEETINGS

	No. of Permits With Pre-submittal Contact	Average Time Span Between Pre-submittal Contact and Final Permit (months)	Average Permitting* Time (months) for Sources With Pre-submittal Contact	No. of Permits Without Pre-submittal Contact	Average Permitting Time* (months) for Sources Without Pre-submittal Contact
1st half 1978	2	14.0	11.0	7	23.9
2nd half 1978	8	16.0	11.0	24	18.5
1st half 1979	14	10.5	7.3	30	7.8
2nd half 1979	17	12.0	7.6	19	9.5
1st half 1980	10	12.2	8.6	43	9.4
2nd half 1980	2	8.0	7.0	18	7.0

*From application submittal to final permit.

1.4 PSD AND NON-ATTAINMENT REVIEW APPLICABILITY

Emissions Subject to Review

Table 1-5 shows the amounts of criteria pollutant emissions reflected in the data base PSD and non-attainment permits. The values, shown in this table, consider only those data base permits that indicate net pollutant emission increases. This table, therefore, more closely depicts the applicability criteria of the 1980 NSR regulations which, unlike the 1978 regulations, generally do not apply to net pollutant decreases. This table also categorizes, by pollutant and size category, the permitted emissions increases for each application. As can be seen, most of the permitted SO_2, NO_x, and CO emissions were caused by applications involving more than 1000 tons/yr increase of these pollutants. This is predominantly the influence of utility power plants and other very large sources. Over 90% of the utility power plants increased emissions of at least one pollutant by more than 1000 tons/yr. Shown below are the relative contributions to total permitted emissions by utility and non-utility (sources other than electric utility generating stations) sources:

Distribution of Data Base Permitted Criteria Pollutant Emissions

	PM	SO_2	NO_x	CO	VOC
Utility Sources	61%	77%	78%	39%	67%
Non-utility Sources	39%	23%	22%	61%	33%

Permit Applications Eliminated From Review at Various Thresholds

Figure 1-4 shows the relationship between the number of data base permit applications that would be eliminated from review and alternative applicability thresholds. These thresholds assume uniform "new major source" (tons/year potential emissions) and "deminimis" values (tons/yr increase in "actual" emissions) for major modifications. Table 1-6 shows the percentage of applications eliminated from review at uniform applicability thresholds of 100, 500 and 1000 TPY. Also shown on this table are the percentages of pollutant reviews and emissions eliminated from review at each threshold. These latter items should not be construed

Table 1-5. DISTRIBUTION OF PERMITTED EMISSION INCREASES OF PM, SO_2, NO_x, CO AND VOC AT VARIOUS APPLICATION SIZE CATEGORIES

Emissions Size Category (Permitted Emissions Increase, Tons/Yr Per PSD Application)[a]	Pollutant (tons/year)									
	PM		SO_2		NO_x		CO		VOC	
	t/yr (1000's)	% of total	t/yr (1000's)	% of total	t/yr (1000's)	% of total	t/yr (1000's)	% of total	t/yr (1000's)	% of total
0 - significant level[b]	.7	1	.6	<1	.3	<1	2.1	1	1.2	5
Significant level - 100	3.3	5	.8	<1	.8	<1	NA[c]		1.3	6
100 - 500	11.0	18	10.3	1	15.9	2	14.0	6	7.0	31
500 - 1000	12.0	19	13.0	2	27.0	4	14.0	6	4.0	18
Greater than 1000	35.0	57	708.0	97	665.0	94	218.0	87	9.0	40
TOTAL	62.0	100	732.7	100	709.0	100	248.1	100	22.5	100

[a]Emissions from applications with permitted net decreases are not included in the table; emissions are discrete values within each category.

[b]Significant levels as defined in the 1980 PSD regulations (tons/year): PM = 25; SO_2 = 40; NO_x = 40; CO = 100; VOC = 40.

[c]100 tons/year emission increase is the significance level for CO emissions.

Figure 1-4. DATA BASE APPLICATIONS ELIMINATED FROM PSD REVIEW AT VARIOUS APPLICABILITY THRESHOLDS

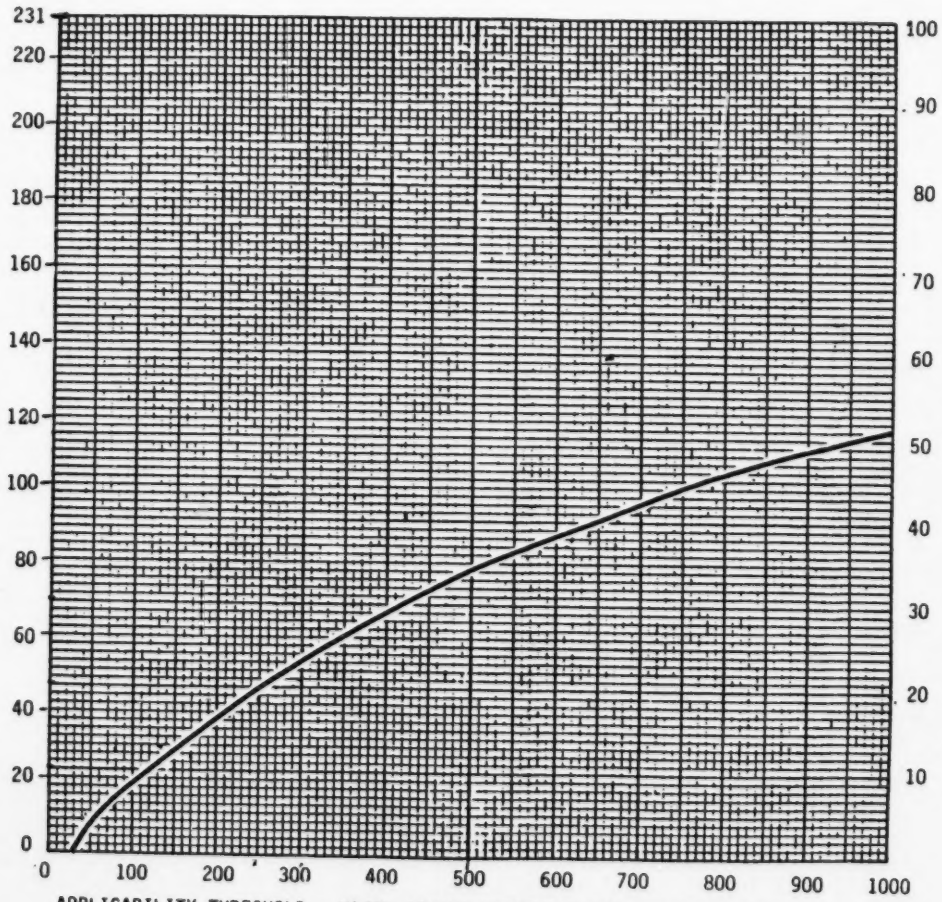


Table 1-6. THE NUMBER OF CRITERIA POLLUTANT REVIEWS AND AMOUNT OF ASSOCIATED EMISSIONS ELIMINATED AT SELECTED UNIFORM APPLICABILITY THRESHOLDS

Emissions Threshold (TPY)	Pollutant	% of Pollutant Reviews Eliminated	% of Emissions Eliminated	% of PSD Applications Eliminated
100	PM	45	6	7
	SO_2	8	<1	
	NO^2	7	<1	
	CO^x	NA	NA	
	VOC	43	8	
500	PM	80	25	33
	SO_2	34	2	
	NO^2	40	2	
	CO^x	55	6	
	VOC	84	40	
1000	PM	91	44	51
	SO_2	47	3	
	NO^2	61	6	
	CO^x	72	11	
	VOC	94	60	

to represent elimination of the complete NSR application from review. This simply is the elimination from review of one or more pollutants per application out of several pollutants that may be subject to review. For instance, at a uniform "deminimis" threshold of 100 tons per year, 7% of the applications that would otherwise be subject to PSD review would be exempt. At this level, 45% of the particulate matter (PM) reviews would be eliminated. This means that the PM emission increases subject to PSD review in 45% of the data base applications were less than 100 tons per year. The PM emissions increase associated with these applications is only 6% of the total data base PM emissions.

In contrast, at a uniform 100 TPY deminimus threshold, only 8% and 7% of the SO_2 and NO_x reviews, respectively, would be exempt. The SO_2 and NO_x emissions increases associated with these reviews are each less than 1% of the total SO_2 and NO_x emissions in the data base.

1.5 ANALYSIS OF BACT AND LAER ASSOCIATED WITH FINAL PERMIT EMISSIONS LIMITATIONS

The emissions values presented in this section reflect only those that were subject to and permitted according to BACT (Best Available Control Technology) and where applicable, LAER (Lowest Achievable Emission Rate). They do not include emissions reductions resulting from equipment shutdowns and similar situations nor do they include permit limitations that were specified solely for the purpose of issuing federally enforceable permit conditions for exemption purposes.

Technology Reviews

Table 1-7 shows, by pollutant, the number of data base applications and emissions units that were subject to BACT or LAER.

As can be seen, NO_x emissions were found to be the pollutant most frequently subject to BACT; VOC emissions were most frequently subject to LAER. Only five of the nine non-criteria pollutants were subject to BACT.

Effects of NSPS and NESHAPS on BACT and LAER

Emission Units. Table 1-8 shows the number of data base emission units that were subject to an NSPS (or NESHAP) and received emissions limitations:

- At the maximum emission rate allowed by the NSPS; and
- At an emissions rate more stringent than the maximum allowed by the NSPS.

Table 1-7. DATA BASE BACT AND LAER APPLICABILITY BY SOURCE AND EMISSION UNITS

Pollutant	Number of Applications (Sources) Subject to BACT*	Number of Applications (Sources) Subject to LAER*	Number of Emission Units Subject to BACT	Number of Emission Units Subject to LAER
Particulate Matter (PM)	163	15	589	35
Sulfur Dioxide (SO_2)	157	6	429	9
Nitrogen Oxides (NO_x)	186	3	727	6
Carbon Monoxide (CO)	95	6	427	12
Volatile Organic Compounds (VOC)	43	26	144	40
Fluorides (F)	9	-	18	-
Vinyl Chlorides	1	-	4	-
Total Reduced Sulfur (TRS)	3	-	6	-
Hydrogen Sulfide (H_2S)	2	-	2	-
Sulfuric Acid Mist	3	-	4	-
Total Technology Reviews			2350	102

*Most applications (sources) were subject to either BACT and/or LAER for more than one pollutant. Therefore, the sum of these columns is greater than the number of data base sources.

Table 1-8. TECHNOLOGY REVIEWS SUBJECT TO NSPS (OR NESHAP) PERMITTED FOR BACT AT NSPS (OR NESHAP) RATE AND BELOW NSPS (OR NESHAP) RATE*

	NSPS (or NESHAP) Pollutant												
	Particulate Matter (PM)		Sulfur Dioxide (SO_2)		Nitrogen Oxides (NO_x)		Carbon Monoxide (CO)		Hydrogen Sulfide (H_2S)	Fluorides (F)	Reduced Sulfur (TRS)	Vinyl Chloride	H_2SO_4 Mist
	Total	Utilities only	Total	Utilities only	Total	Utilities only	Total	Utilities only	Total	Total	Total	Total	Total
Number of emission units permitted for BACT at NSPS (or NESHAP) rate	75	31	107	35	135	45	7	0	1	14	3	4	2
Number of emission units permitted for BACT below NSPS (or NESHAP) rate	34	15	51	26	24	20	2	0	0	4	1	0	1
% NSPS (or NESHAP) units subject to BACT permitted below NSPS (or NESHAP) rate	31%	32%	32%	43%	15%	30%	22%	–	0%	22%	25%	0%	33%
Ratio of BACT to NSPS Allowable Emission Rate for Emission Units Permitted Below NSPS Rate	.49	.50	.45	.44	.79	.79	.52	–	–	.44	.84	–	.67

*An emission unit subject to NSPS for 2 pollutants is considered to undergo 2 technology reviews.

Note: Most VOC NSPS (or NESHAP) are work practice or equipment standards - unable to quantify emissions.

Similar statistics specific to utility sources are also shown. For all data base emission units subject to NSPS (or NESHAPS), 27% were issued emission limits more stringent than the applicable NSPS (or NESHAP) would allow. This value is 36% for utility power plant sources. On a criteria pollutant specific basis for all data base sources, this value ranged from 15% for NO_x emissions to 32% for SO_2. For utilities, this value ranged from 30% for NO_x emissions to 43% for SO_2 emissions.

The bottom line on Table 1-8 shows, for emission units permitted more stringent than the applicable NSPS, the ratio of the average BACT-permitted emissions rates to the average of the maximum emissions rates allowed by the applicable NSPS (or NESHAP).

Allowable Emissions. Table 1-9 shows a distribution of all BACT-permitted emissions by utility and non-utility sources including those BACT-permitted emissions subject to NSPS (or NESHAP). Also shown are emissions reductions beyond NSPS (or NESHAP) resulting from emissions limitations being more stringent than the applicable NSPS. As can be seen, the majority of emissions reductions beyond NSPS occurred at utility sources. Note, however, that the majority of BACT-permitted emissions subject to NSPS also occurred at utility sources. This relationship is shown below for PM, SO_2, NO_x and CO emissions:

	Relative Contribution to Emission Reductions Beyond NSPS		Relative Contribution to BACT-Permitted Emissions Subject to NSPS	
Pollutant	Utility Sources	Non-utility Sources	Utility Sources	Non-utility Sources
PM	79%	21%	79%	21%
SO_2	96%	4%	93%	7%
NO^2	98%	2%	90%	10%
CO^x	0%	100%	0%	100%

It appears that the distribution of emission reductions beyond NSPS is fairly consistent with the distribution of BACT-permitted emissions subject to NSPS for utility and non-utility sources.

Table 1-9. TOTAL BACT-PERMITTED POLLUTANT EMISSIONS, EMISSIONS SUBJECT TO NSPS (OR NESHAPS) AND EMISSIONS REDUCTIONS BEYOND NSPS (OR NESHAPS) BY UTILITY POWER PLANT SOURCES AND NON-UTILITY SOURCES

	PSD Pollutant																	
	Particulate Matter (PM)		Sulfur Dioxide (SO_2)		Nitrogen Oxides (NO_x)		Carbon Monoxide (CO)		Volatile Organic Compounds (VOC)*	Hydrogen Sulfide (H_2S)		Fluorides (F)		Total Reduced Sulfur (TRS)		Vinyl Chloride		H_2SO_4 Mist	
	Total	Subject to NSPS	Total	Subject to NSPS	Total	Subject to NSPS	Total	Subject to NSPS	Total	Total	Subject to NSPS	Total	Subject to NSPS	Total	Subject to NSPS	Total	Subject to NESHAPS	Total	Subject to NSPS
BACT permitted emissions for non-utility sources - tons/yr	22,800	7,400	192,400	41,500	162,500	63,700	97,600	7,500	9,200	700	580	300	300	1,160	60	110	110	180	120
BACT permitted emissions for utility sources - tons/yr	31,400	27,800	569,400	561,900	549,900	542,600	61,500	0	4,500	0	0	510	0	0	0	0	0	0	0
Total BACT permitted emissions - tons/yr	54,200	35,200	761,800	603,400	712,400	606,300	159,100	7,500	13,700	700	580	810	300	1,160	60	110	110	180	120
BACT permitted emissions reductions beyond NSPS by non-utility sources - tons/yr	-	1,600	-	8,500	-	1,200	-	2,970	-	-	0	-	240	-	1	-	0	-	2
BACT permitted emissions reductions beyond NSPS by utility sources - tons/yr	-	6,100	-	210,200	-	53,200	-	0	-	-	0	-	0	-	0	-	0	-	0
Total BACT permitted emission reductions beyond NSPS - tons/yr	-	7,700	-	218,700	-	54,400	-	2,970	-	-	-	240	-	1	-	0	-	2	

*VOC NSPS's are generally work practice or equipment standards. Unable to quantify VOC emissions subject to NSPS.

For all pollutants, on a percentage basis, more utility emissions are subject to NSPS than non-utility emissions:

	BACT-Permitted Emissions (TPY)				
	Total Data Base	Subject to NSPS Total	Subject to NSPS % of Data Base	Emission Reductions Beyond NSPS (TPY)	Total "Hypothetical" NSPS Allowable Emissions (TPY)
Utility Sources	1,220,000	1,130,000	93%	270,000	1,400,000
Non-utility Sources	487,000	121,000	25%	14,500	135,500
Total	1,707,000	1,251,000	73%	284,500	1,535,500

For all sources, 73% of the BACT-permitted emissions were subject to NSPS. Twenty-five percent (25%) of non-utility source emissions are subject to NSPS (or NESHAP), whereas 93% of utility source emissions are subject to NSPS.

BACT vs. LAER

Of the 285 PSD applications, 35 were subject to non-attainment review for certain pollutants. The data were extracted from EPA files which, in most cases, do not contain LAER technology data since LAER reviews are performed by State agencies. Therefore, sufficient LAER control technology data are available for only 15 of the 35 PSD applications to compare with BACT data. The 15 applications include 26 emissions units subject to LAER technology review for one or more pollutants. The total number of LAER technology reviews in these applications, determined by counting the number of non-attainment pollutants reviews for each emission unit, is 54.

Table 1-10 lists ranges of typical ranges of BACT emissions limits for comparison with the 54 LAER review emission limits. The upper and lower ends of these ranges do not represent the extremes for all BACT determinations made. Rather, they represent "typical" determinations based on BACT limits from the data base (285) PSD permits and EPA's Compilation of BACT/LAER Determinations.

Comparisons of LAER allowable emission rates with BACT ranges show that LAER emissions are generally in the lower portions of the BACT ranges. However, it does not appear that LAER produces a distinguishable level of stringency over BACT.

Table 1-10. LAER TECHNOLOGY AND EMISSIONS DATA FOR DATA BASE PSD SOURCES SUBJECT TO NON-ATTAINMENT REVIEW FOR ONE OR MORE POLLUTANTS[a]

Application	Region	Emissions Unit Description	Non-attainment Pollutant	Selected LAER Control Technology	LAER Emissions Limit	Applicable NSPS Limit	Is BACT Technology Typically Used For LAER?	BACT Range[b]
1. PPG Industry 79 WV 06	4	Boiler - 243 MMBtu/hr 1.7% S, 14.3% ash bituminous coal	PM	Baghouse	0.042 lb/MMBtu	None	Yes	0.016 to >0.1[c] lb/MMBtu
2. General Motors Corp. EPA-5-A-80-12	5	Boiler - 150 MMBtu/hr 0.7% S fuel oil	SO_2	Low Sulfur Fuel	1.0 lb/MMBtu	None	Yes	0.5 to 1.2[d] lb/MMBtu
3. General Motors Corp. EPA-5-A-80-6	5	2 - boilers, 156 MMBtu/hr each, 0.87% S, 10% ash coal	PM	Baghouse	0.06 lb/MMBtu	None	Yes	0.016 to >0.1[c] lb/MMBtu
		Coal storage pile fugitives	PM	Surfactant Spray Suppression	None	None	Yes	N/A
4. Muscatine Power and Water	7	Electric steam generator - 1546 MMBtu/hr (166MW), 3.1% S, 8.7% ash coal	PM	Baghouse	0.03 lb/MMBtu (203 TPY)	0.03 lb/MMBtu (203 TPY)	Yes	.015 to .03[e] lb/MMBtu
5. Tennessee Eastman TN-065	4	2 - boilers, 780 MMBtu/hr each, low sulfur coal	PM	ESP	0.018 lb/MMBtu (123 TPY)	0.1 lb/MMBtu (683 TPY)	Yes	0.016 to 0.1[e] lb/MMBtu
		Coal pile fugitives	PM	Chemical Surfactants	None	None	Yes	N/A

Table 1-10. LAER TECHNOLOGY AND EMISSIONS DATA FOR DATA BASE PSD SOURCES SUBJECT TO NON-ATTAINMENT REVIEW FOR ONE OR MORE POLLUTANTS[a] (continued)

Application	Region	Emissions Unit Description	Non-attainment Pollutant	Selected LAER Control Technology	LAER Emissions Limit	Applicable NSPS Limit	Is BACT Technology Typically Used For LAER?	BACT Range[b]
6. Gilman Paper GA-071	4	Coal/wood/oil boiler - 587 MMBtu/hr on coal (1.5% S; 12% ash) and 941 MMBtu/hr on wood (<0.1% S); fuel oil sulfur content is about three percent	PM	ESP	0.07 lb/MMBtu (227 TPY)	0.1 lb/MMBtu (324 TPY)	Yes	.016 to 0.1[c] lb/MMBtu
			SO_2	Caustic Scrubber	Wood/Coal - 1.2 lb/MMBtu (2143 TPY) Wood/Oil - 0.8 lb/MMBtu	1.2 lb/MMBtu (2143 TPY) 0.8 lb/MMBtu	Yes	.33 to 1.2[e] lb/MMBtu
7. Firestone Tire Co. GA-068	4	Tire sealant lines (2), capacity is confidential.	VOC	Carbon Adsorption Minimum 90% Efficiency	7.4 lb/hr	None	No	Unable to find BACT comparison. Incineration is typical VOC BACT.
		Fugitives from warehouse ventilation	VOC	No Control	58 lb/hr	None	Yes	N/A
8. Firestone Tire Co. GA-067	4	Boiler - 96.4 MMBtu/hr; 1% S oil or gas fired	CO	Combustion Controls	0.08 lb/MMBtu	None	Yes	0.03 to 0.41[d] lb/MMBtu
9. Ashland Petroleum KY-155	4	Reduced crude conversion system 55,000 BBL/day	PM	Venturi Scrubber	0.45 lb/1000 lb coke burnoff (299 TPY)	1.0 lb/1000 lb coke burnoff (644 TPY)	Yes	0.5 to 1.0 lb/ 1000 lb coke burnoff
			SO_2	Venturi Scrubber	437 lb/MBBL Feed	None	No	500 to 1100 lb/MBBL Feed
			VOC	Waste CO Boiler Incineration	8 PPMV	None	Yes	Unable to find BACT comparison. CO boiler is typical.

Table 1-10. LAER TECHNOLOGY AND EMISSIONS DATA FOR DATA BASE PSD SOURCES SUBJECT TO NON-ATTAINMENT REVIEW FOR ONE OR MORE POLLUTANTS[a]
(continued)

Application	Region	Emissions Unit Description	Non-attainment Pollutant	Selected LAER Control Technology	LAER Emissions Limit	Applicable NSPS Limit	Is BACT Technology Typically Used For LAER?	BACT Range[b]
		Fugitive VOC from equipment leaks	VOC	Leak Detection and Repair	None	None	Yes	N/A
10. Nevada Power Company NV-80-01	9	No. 8 gas turbine generator - 73.5 Megawatts output, ≈800 MMBtu/hr heat input; 0.25% S, low ash fuel oil fired	PM	Low Ash Fuel	≈0.03 lb/MMBtu	None	Yes	0.04 to 0.11 lb/MMBtu
			CO	No Control	≈0.13 lb/MMBtu	None	Yes	0.12 to 0.68 lb/MMBtu
			VOC	No Control	≈0.006 lb/MMBtu	None	Yes	0.02 to 0.11 lb/MMBtu
11. Nevada Power Company NV-78-02	9	No. 7 gas turbine generator - 73.5 Megawatts output ≈800 MMBtu/hr heat input; 0.25% S, low ash fuel oil or natural gas fired	PM	Low Ash Fuel	≈0.03 lb/MMBtu	None	Yes	0.04 to 0.11 lb/MMBtu
			CO	No Control	≈0.13 lb/MMBtu	None	Yes	0.12 to 0.68 lb/MMBtu
			VOC	No Control	≈0.006 lb/MMBtu	None	Yes	0.02 to 0.11 lb/MMBtu
12. Borg Warner EPA-5-A-80-4	5	Resin compounding facility - 15 process vents	VOC	Waste Air Burner	9.2 lb/hr	None	Yes	Similar to solvent (VOC) emissions BACT. Unable to quantify comparable BACT limits.

Table 1-10. LAER TECHNOLOGY AND EMISSIONS DATA FOR DATA BASE PSD SOURCES SUBJECT TO NON-ATTAINMENT REVIEW FOR ONE OR MORE POLLUTANTS[a] (continued)

Application	Region	Emissions Unit Description	Non-attainment Pollutant	Selected LAER Control Technology	LAER Emissions Limit	Applicable NSPS Limit	Is BACT Technology Typically Used For LAER?	BACT Range[b]
13. City of Columbus EPA-5-A-80-3	5	6 - refuse and coal fired electric steam generators; 246 MMBtu/hr ea; coal is 0.9% S, and 10% ash	PM	ESP	0.1 lb/MMBtu	None	Yes	0.033 to >0.1 lb/MMBtu
			SO_2	Low Sulfur Fuel	0.95 lb/MMBtu	None	Yes	0.63 to >1.2 lb/MMBtu
			CO	Combustion Controls	0.26 lb/MMBtu	None	Yes	0.25 to 5.1 lb/MMBtu
			VOC	Combustion Controls	0.016 lb/MMBtu	None	Yes	0.043 to 0.25 lb/MMBtu
14. Weyerhauser Longview PSD-X-81-02	10	Boiler - 1240 MMBtu/hr; coal 0.8% S; 18.7% ash	PM	Electro-Scrubber	0.03 lb/MMBtu (163 TPY)	0.1 lb/MMBtu (543 TPY)	No	0.016 to 0.1 lb/MMBtu
15. Publishers Paper PSD-X-80-03	8	Boiler - 552.5 MMBtu/hr; hog fuel (wood and bark)	VOC	Combustion Controls	0.26 lb/MMBtu	None	Yes	0.25 to 4.4 lb/MMBtu
16. Modesto Irregation District NSR-4-4-8 SJ 79-16	9	Gas turbine 1693 MMBtu/hr; 0.3% S fuel oil	NO_x	Unknown	75 ppmv	75 ppmv	Unknown	75-150 ppmv

Table 1-10. LAER TECHNOLOGY AND EMISSIONS DATA FOR DATA BASE PSD SOURCES SUBJECT TO NON-ATTAINMENT REVIEW FOR ONE OR MORE POLLUTANTS[a] (concluded)

Application	Region	Emissions Unit Description	Non-attainment Pollutant	Selected LAER Control Technology	LAER Emissions Limit	Applicable NSPS Limit	Is BACT Technology Typically Used For LAER?	BACT Range[b]
17. Refuse Fuels Incorporated	1	Refuse incinerator; 960 tons/day	PM	Unknown	0.03 gr/dscf (96 TPY)	0.08 gr/dscf (257 TPY)	Unknown	0.02 to 0.08 gr/dscf
			VOC	Unknown	7.99 lb/hr	None	Unknown	Unknown

[a]The data base contains 285 applications of which 35 required concurrent PSD and non-attainment review. LAER technology data is available for only 15 of the 35 applications (table entries 1-15). Seven applications have units subject to both NSPS and LAER (table entries 4-6, 9, 14, 16 and 17).

[b]Range of typical BACT limits as determined from the Compilation of BACT/LAER Determinations, revised (450/2-80-070, May 1980), data base BACT determinations and AP-42 emission factors. This range does not encompass all BACT determinations, but indicates the typical values specified for BACT in PSD permits.

[c]The range is for coal fired industrial boilers with less than or equal to 250 MMBtu/hr heat input (not subject to NSPS).

[d]The range is for oil fired industrial boilers with less than 250 MMBtu/hr heat input (not subject to NSPS).

[e]Range is for coal fired boilers with greater than 250 MMBtu/hr heat input (least stringent BACT or LAER is the applicable NSPS).

Effect of Emission Unit Size on BACT-Permitted Emissions and Emissions Reductions Beyond NSPS

Shown in Tables 1-11 through 1-15 are distributions of BACT-permitted emissions, BACT-permitted emissions subject to NSPS, and emission reductions beyond NSPS by sizes of emission units. The size of an emission unit is based on its annual BACT-permitted emission rate in tons per year. The data are presented both graphically and in tabular format.

As shown on Table 1-11, 59% of all BACT-permitted PM emissions units are less than 25 tons/year in size and represent only 5% of the BACT permitted PM emissions in the data base. In this size range, only 8% of the PM emissions units were subject to NSPS.

Only five PM emission units (1% of total) were permitted to emit greater than 1000 tons/year PM. All five of these were subject to NSPS and were permitted at the maximum emission rate allowed by the NSPS (therefore, no emissions reductions beyond NSPS were realized for this size class). The size class of 100-500 tons/year and 500-1000 tons/year produced the majority (80%) of emission reductions beyond NSPS. The NSPS emission units in these size categories were permitted to emit 24,400 tons/year PM (17% + 18% = 45% of 54,200 tons/year), some 6100 tons/year PM less than the level allowed by the NSPS.

In contrast to PM, SO_2 emission units greater than 1000 tons/year size were permitted to emit the majority of SO_2 emissions. As shown in Table 1-12, 26% of all SO_2 emission units and 92% of all BACT-permitted SO_2 emissions are in this size class. Furthermore, the majority of SO_2 emission reductions beyond NSPS were achieved in this size class. This size class generally consists of utility and large industrial boilers. Some industrial boilers in this category were not subject to NSPS because of their heat input (less than 250 MMBtu/hr). Note that the 0-40 tons/year SO_2 size class emission units are 34% of all SO_2 emission units. However, the corresponding allowable SO_2 emissions for these units are less than 1% of the total SO_2 emissions in the data base. Interestingly, 47% of the emission units in the 0-40 ton category were subject to NSPS. These small NSPS emissions units consist mainly of heaters, boilers and furnaces at petroleum refineries burning refinery fuel gas and are generally subject to NSPS.

Table 1-11. DISTRIBUTION OF BACT-PERMITTED EMISSIONS AND EMISSIONS REDUCTIONS BEYOND NSPS BY SIZE OF EMISSION UNIT

POLLUTANT: PARTICULATE MATTER (PM)

Emission Unit Size Category (tons/year allowable emissions)	# of Emission Units in Size Category	BACT-Permitted PM Emission Units*		BACT-Permitted PM Emissions**		BACT-Permitted PM Emission Units Subject to NSPS		BACT-Permitted PM Emissions Subject to NSPS		PM Emission Reductions Beyond NSPS Subject to BACT***	
		% of total	Cum. % of total	% of total	Cum. % of total	% of size category	% of total*	% of size category	% of total**	% of all PM emission reductions beyond NSPS	Cum. % of all PM emission reductions beyond NSPS
0 - 25	348	59	59	5	5	8	5	10	1	14	14
25 - 100	129	22	81	12	17	17	4	18	2	6	20
100 - 500	80	14	95	33	50	39	5	52	17	38	58
500 - 1000	27	4	99	33	83	85	4	86	28	42	100
>1000	5	1	100	17	100	100	1	100	17	0	100

* Total BACT-permitted PM emission units = 589.
** Total BACT-permitted PM emissions = 54,200 tons/year.
***Total BACT-permitted PM emission reductions beyond NSPS = 7,700 tons/year.

Table 1-12. DISTRIBUTION OF BACT-PERMITTED EMISSIONS AND EMISSIONS REDUCTIONS BEYOND NSPS BY SIZE OF EMISSION UNIT

POLLUTANT: SULFUR DIOXIDE (SO_2)

Emission Unit Size Category (tons/year allowable emissions)	# of Emission Units in Size Category	BACT-Permitted SO_2 Emission Units*		BACT-Permitted SO_2 Emissions**		BACT-Permitted SO_2 Emission Units Subject to NSPS		BACT-Permitted SO_2 Emissions Subject to NSPS		SO_2 Emission Reductions Beyond NSPS Subject to BACT***	
		% of total	Cum. % of total	% of total	Cum. % of total	% of size category	% of total*	% of size category	% of total**	% of all SO_2 emission reductions beyond NSPS	Cum. % of all SO_2 emission reductions beyond NSPS
0 - 40	144	34	34	<1	<1	47	16	35	<1	1	1
40 - 100	30	7	41	<1	<1	17	1	14	<1	<1	1
100 - 500	93	22	63	3	3	9	2	8	<1	<1	1
500 - 1000	49	11	74	5	8	20	2	23	1	13	14
>1000	113	26	100	92	100	59	16	85	78	86	100

* Total BACT-permitted SO_2 emission units = 429.
** Total BACT-permitted SO_2 emissions = 761,800 tons/year.
***Total BACT-permitted SO_2 emission reductions beyond NSPS = 218,700.

Table 1-13. DISTRIBUTION OF BACT-PERMITTED EMISSIONS AND EMISSIONS REDUCTIONS BEYOND NSPS BY SIZE OF EMISSION UNIT

POLLUTANT: NITROGEN OXIDES (NO_x)

Emission Unit Size Category (tons/year allowable emissions)	# of Emission Units in Size Category	BACT-Permitted NO_x Emission Units*		BACT-Permitted NO_x Emissions**		BACT-Permitted NO_x Emission Units Subject to NSPS		BACT-Permitted NO_x Emissions Subject to NSPS		NO_x Emission Reductions Beyond NSPS Subject to BACT***	
		% of total	Cum. % of total	% of total	Cum. % of total	% of size category	% of total*	% of size category	% of total**	% of all NO_x emission reductions beyond NSPS	Cum. % of all NO_x emission reductions beyond NSPS
0 - 40	189	26	26	<1	<1	3	<1	5	<1	0	0
40 - 100	122	17	43	1	1	7	1	8	<1	0	0
100 - 500	257	35	78	9	10	13	5	16	1	2	2
500 - 1000	79	11	89	8	18	56	6	59	5	0	2
>1000	80	11	100	82	100	86	9	97	79	98	100

* Total BACT-permitted NO_x emission units = 727.
** Total BACT-permitted NO_x emissions = 712,400 tons/year.
***Total BACT-permitted NO_x emission reductions beyond NSPS = 54,400 tons/year.

Table 1-14. DISTRIBUTION OF BACT-PERMITTED EMISSIONS AND EMISSIONS REDUCTIONS BEYOND NSPS BY SIZE OF EMISSION UNIT

POLLUTANT: CARBON MONOXIDE (CO)

Emission Unit Size Category (tons/year allowable emissions)	# of Emission Units in Size Category	BACT-Permitted CO Emission Units*		BACT-Permitted CO Emissions**		BACT-Permitted CO Emission Units Subject to NSPS		BACT-Permitted CO Emissions Subject to NSPS		CO Emission Reductions Beyond NSPS Subject to BACT***	
		% of total	Cum. % of total	% of total	Cum. % of total	% of size category	% of total*	% of size category	% of total**	% of all CO emission reductions beyond NSPS	Cum. % of all CO emission reductions beyond NSPS
0 - 100	297	69	69	4	4	0	0	0	0	0	0
100 - 500	71	17	86	10	14	1	<1	2	<1	0	0
500 - 1000	20	5	91	10	24	20	1	20	2	45	45
>1000	39	9	100	76	100	5	<1	3	3	55	100

* Total BACT-permitted CO emission units = 427.
** Total BACT-permitted CO emissions = 159,100 tons/year.
***Total BACT-permitted CO emission reductions beyond NSPS = 2,970 tons/year.

Table 1-15. DISTRIBUTION OF BACT-PERMITTED EMISSIONS AND EMISSIONS REDUCTIONS BEYOND NSPS BY SIZE OF EMISSION UNIT

POLLUTANT: VOLATILE ORGANIC COMPOUNDS (VOC)

Emission Unit Size Category	# of Emission Units in Size Category	BACT-Permitted VOC Emission Units*		BACT-Permitted VOC Emissions**	
(tons/year allowable emissions)		% of total	Cum. % of total	% of total	Cum. % of total
0 - 40	88	61	61	6	6
40 - 100	16	11	72	6	12
100 - 500	35	24	96	58	70
500 - 1000	4	3	99	18	88
>1000	1	1	100	12	100

* Total-BACT permitted VOC emission units = 144.
** Total-BACT permitted VOC emissions = 13,700 tons/year.

Note: VOC NSPS's are generally work practice or equipment standards. Unable to quantify VOC emissions subject to a NSPS.

Table 1-13 for NO_x emissions is similar to Table 1-12 for SO_2 emissions in that the majority of permitted emissions and emissions reductions beyond NSPS occurred at emissions units greater than 1000 tons/year size.

Total BACT-permitted allowable PM, SO_2, NO_x and CO emissions and emissions reductions beyond NSPS are as follows:

Pollutant	Total BACT-Permitted (tons/year)	Reductions Beyond NSPS (tons/year)
PM	54,200	7,700
SO_2	761,800	218,700
NO_x	712,400	54,400
CO	159,100	2,970

Corresponding values for VOC emissions reductions beyond NSPS are not presented since most VOC standards are based on the type of equipment used and/or work practices, and quantification in terms of emissions is difficult.

Emission Reductions From Proposed BACT Emission Levels

In at least 63 data base applications (22%), PSD applicants received emissions limitations more stringent than those proposed as BACT. Factors such as air quality impacts, increment consumption and case-by-case evaluation influenced the permitting authorities' decision process. In some cases, these sources were subject to NSPS and the associated emissions reductions in those cases were accounted for in the previous subsection.

Table 1-16 shows the (non-NSPS) data base emissions reductions caused by PSD permits issued with emission limits more stringent than those proposed by the applicant in addition to emissions reductions beyond NSPS.

Effect of PSD on Allowable Emissions

It is impossible to determine the levels at which the data base sources would have been allowed to emit in the absence of PSD provisions. For example, for sources not subject to NSPS, an applicant might have proposed and been allowed to emit pollutants at the levels prescribed in the respective State Implementation Plan (SIP). In other cases, however, an emissions limiting factor may have been the NAAQS ceilings, or other air quality factors. Quantification of these "upper bounds" for non-NSPS sources was beyond the scope of this project.

Table 1-16. CUMULATIVE BACT PERMITTED EMISSIONS REDUCTIONS ASSOCIATED WITH PSD

	Pollutant									
	PM	SO_2	NO_x	CO	VOC	H_2S	F	TRS	Acid Mist	Vinyl Chloride
Emissions reductions beyond NSPS - tons/yr	7,700	218,700	54,400	2,970	N/A	0	240	2	2	
Non-NSPS emissions reductions associated with proposed vs. permitted BACT - tons/yr	5,100	34,200	5,100	3,000	N/A	0	0	0	0	
Total emissions reductions - tons/yr	12,800	252,900	59,500	5,970	N/A	0	240	2	2	
Total BACT-permitted emissions - tons/yr	54,200	761,800	712,400	159,100	13,700	700	300	1,160	180	110

However, some measure of the effect of the NSR program can be obtained by considering only: sources that were subject to NSPS; and sources which were not subject to NSPS but had to adopt BACT limits more stringent than those proposed in their original application. For the various pollutants, reductions from "hypothetical" NSPS levels (i.e., those levels at which the source would be allowed to emit if it were just to meet NSPS requirements) and reductions for other sources representing the difference between proposed and final BACT are shown in Table 1-16. These "reductions" expressed as a percentage of the hypothetical/proposed level for the criteria pollutants are:

PM - 17%
SO_2 - 25%
NO_x - 8%
CO - 4%

Expressed as a percentage of the final permitted BACT emissions, these reductions are:

PM - 24%
SO_2 - 33%
NO_x - 8%
CO - 4%

That is, in the absence of the PSD program, PM emissions could have been about one-fourth higher than the permitted PM emissions and SO_2 emissions about one-third higher than the permitted SO_2 emissions.

1.6 ANALYSIS OF AIR QUALITY IMPACTS

Frequency of Air Quality (A/Q) Analyses

Of the 285 data base applications, 213 were required to perform air quality impacts analyses. A total of 451 pollutant specific air quality reviews were performed distributed as shown below:

Pollutant	# of A/Q Reviews	% of Total
PM	90	20
SO_2	124	27
NO_x	163	36
CO	67	15
VOC	3	<1
F	2	<1
H_2S	2	<1
Total	451	100

As shown, NO_x was the pollutant most frequently subject to air quality analyses.

Site specific ambient monitoring was provided in 18% of the PSD applications requiring A/Q analyses. Another 25% of the cases used existing State or other network ambient monitoring data and 57% of the PSD applications requiring A/Q analyses provided no actual ambient air quality monitoring data. In these latter cases, existing ambient air quality was determined by dispersion modeling, assuming approved background concentrations, or some other approved method.

Effects of Allowable PSD Increment Constraints

The most limiting air quality factor was the allowable 24-hour SO_2 increment of 91 ug/m^3. As shown below, except for this factor, very few A/Q analyses predicted that more than 85% of the respective allowable PSD increment would result from the proposed project.

	Pollutant/Increment Averaging Period				
	PM		SO_2		
	24-hr	Annual	3-hr	24-hr	Annual
% of Cases* Where More Than 85% Impact was Predicted	5%	0%	6%	19%	2%

*Based on total number of pollutant specific A/Q analyses.

In many cases where A/Q analyses were required, the applicant did not perform full A/Q analyses because preliminary screening indicated the

impacts expected to result from the proposed project were "insignificant."* In some of these cases, due to possible increment violations in the vicinity of the source, a demonstration of "insignificant" impact was required in order to receive a PSD permit. Therefore, those cases where insignificant impacts were indicated does not necessarily mean that a substantial amount of PSD increment was available.

Where PM and SO_2 A/Q analyses were required, project alterations were made in at least 28 cases (13%) to avoid increment violations that could have precluded permit issuance. Those alterations are distributed as shown below:

Alteration	# of Cases	Limiting Factors
1. More Stringent BACT	11	3-hr SO_2 (2); 24-hr SO_2 (7); 24-hr PM (2)
2. Increase Stack Height	5	3-hr SO_2 (1); 24-hr SO_2 (4)
3. Switch to Cleaner Fuel	3	24-hr PM (1); needed insignificance (2)
4. Emission Reductions Elsewhere	3	24-hr SO_2 (3)
5. Limit Hours of Operation	1	Unknown
6. Other	5	Unknown

*"insignificant" A/Q impact is quantified in the preamble to the 1978 NSR regulations.

Effects of Constraints Caused by National Ambient Air Quality Standards (NAAQS)

The A/Q analyses dealing with NAAQS compliance demonstration did not appear to have had much effect on PSD projects. The most limiting NAAQS was the 24-hour allowable ambient TSP concentration of 150 ug/m^3. As shown below, few A/Q analyses predicted that the proposed projects would result in ambient air quality concentrations that exceeded 90% of the respective NAAQS:

NAAQS Pollutant/Averaging Period

	TSP		SO_2			NO_x	CO	
	24-hr	Annual	3-hr	24-hr	Annual	Annual	1-hr	8-hr
% of Cases* Where More Than 90% NAAQS Impacted	9%	0%	3%	3%	0%	2%	0%	0%

*Based on total number of pollutant specific A/Q analyses.

Effect of A/Q Constraints on Emissions Reductions Beyond NSPS

A rough screening analysis was performed to determine reasons for emissions reductions beyond NSPS. For those PSD permits where allowable emissions were below the maximums allowed by the applicable NSPS, the A/Q analyses were evaluated. Based on those evaluations the PM and SO_2 reductions beyond NSPS were distributed among four categories:

- As a result of NAAQS constraints;
- As a result of Increment Constraints;
- As a result of case-by-case BACT; and
- Cause Unknown.

Table 1-17 summarizes that distribution. As shown, it appears that the majority of SO_2 emissions reductions beyond NSPS resulted from increment constraints. Particulate matter emissions reductions beyond NSPS were difficult to categorize because many (about 50%) PM air quality analyses predicted "insignificant" ambient impacts and no estimation of PM increment availability and ambient air quality were provided.

1.7 MISCELLANEOUS ASSOCIATED ANALYSES

As part of this study, certain situations were studied to assess the general effects of existing and alternative provisions of NSR regulations. Presented in this section are the highlights of the more substantive studies.

Effect of Class I Allowable SO_2 Increment on Power Plant Siting

Dispersion modeling of a hypothetical 640 MWe power plant was performed to determine the minimum distance from a Class I area that it can locate without violating the Class I increment. As shown in Table 1-18, if the power plant was allowed to emit SO_2 at .3 lbs/MMBtu and located in flat

Table 1-17. EMISSION REDUCTIONS BEYOND NSPS AND PARTIAL CONTRIBUTIONS BY PROBABLE CAUSE OF THOSE REDUCTIONS
(tons/year)

	As a Result of NAAQS Constraints	As a Result of Increment Constraints	As a Result of Case-by-Case BACT	Unable to Determine Cause*	Total Emission Reductions Beyond NSPS	Total Permitted Emissions for Sources Subject to NSPS
SO_2	36,100	115,500	56,600	10,500	218,700	603,400
PM	0	200	2,300	5,200	7,700	35,200

*Insufficient data to categorize emission reductions.

Table 1-18. EFFECTS OF CLASS I SO_2 INCREMENT ON THE SITING OF A 640 MWe POWER PLANT

Terrain Type	Averaging Period	*Distance of Source from Class I Area Beyond Which SO_2 Increment is not Exceeded		
		Case I: 1.2 lb/MMBtu, 90% SO_2 Removal	Case II: .6 lb/MMBtu, 70% SO_2 Removal	Case III: .3 lb/MMBtu, 70% SO_2 Removal
Flat	24-hour	100	42	19
	Annual	20	0	0
Complex	24-hour	>100	>100	>100
	Annual	91	48	26

terrain, it must locate at least 19 kilometers from the Class I area. The same power plant in complex terrain must locate at a distance of more than 100 kilometers from the Class I area. Higher allowable SO_2 emission rates were also evaluated and the results are shown. In each case, the limiting factor is the allowable 24-hour SO_2 Class I increment.

Effect of Alternative Class I Increment System on Emissions Near Class I Areas

One alternative cited by the National Commission on Air Quality (NCAQ) was to eliminate short term increment tracking in Class I areas and allow a source the entire short term increment. Annual increment tracking would still be retained.

The allowable Class I SO_2 increment was evaluated under this proposal by studying three different cases:

Case 1 - Remote Class I area; little or no industrial activity;

Case 2 - Class I area of moderate industrial activity; two or more closely spaced sources; and

Case 3 - Class I area of heavy industrial activity; numerous sources around a Class I area.

Table 1-19 summarizes the results of this study and impacts on potential emissions change, potential ambient impacts and reduction in air quality dispersion modeling requirements. Generally, there could be a moderate increase in SO_2 emissions and ambient SO_2 concentrations but in some cases, SO_2 emissions could increase by as much as 250% in the area. This would occur when sources were clustered upwind of the impact area.

Cost to Prepare a PSD Application

In conjunction with EPA, a study was performed to determine the approximate range of cost for dispersion modeling supporting a PSD application. This evaluation showed that, in general, dispersion modeling for a PSD application will range from $10,000 to $130,000. However, this value could be as low as $3,000 and as high as $400,000 or more.

Ten PSD permits were selected representative of data base source categories and locations and the applicants were asked to provide cost data on the preparation of their PSD applications. Table 1-20 summarizes the responses and the costs are broken down into the three most extensive parts of a PSD application:

Table 1-19.

ESTIMATED EFFECTS OF ELIMINATING SHORT-TERM INCREMENT TRACKING

Case	Emissions Change	Air Quality* Impact	Reduction in Required Air Quality Modeling
1	None	None	None
2	0-250% Incr.	24-hr: 0-13 ug/m^3 Incr. annual: 0-1.4 ug/m^3 Incr.	Moderate
3	0-67% Incr.	24-hr: 0-3.6 ug/m^3 Incr. annual: 0-.7 ug/m^3 Incr.	Substantial

*Based on SO_2 emissions

Table 1-20. CASE STUDY OF WORK YEARS AND COST TO PREPARE PSD APPLICATIONS

Source Type	State Where Source is Located	New Source	Modification Type Unit	No. of Pollutants Subject to PSD	Source or Contractor Prepared Application	NAAQS Threatened by Proposed Construction	No. of Models Used in Impact Analysis	No. of Sources Considered in Modeling Analysis	Modeling Costs Higher Due to Modeling More Than Once	Work Years Required for Impact Analysis	Cost of Impact Analysis ($)	Work Years Required for BACT Analysis	Cost of BACT Analysis ($)	Source Required to Conduct Pre-construction Monitoring	Pollutant(s) Monitored by Source	Ambient Monitoring Provided by State Agency	Work Years Required for Air Quality Monitoring Analysis	Cost of Air Quality Monitoring Analysis ($)	Total Work Years Required to Prepare PSD Application	Total Cost of Prepare PSD Application ($)
Chemical Processing	NJ	No	Combustion	3	Source	Yes	2	8	No	0.2	12,800	0.04	2,560	No	NA	Yes	negligible	640	0.25	16,000
Electric Utility	NY	Yes	NA	4	Source	No	2	14	No	1.005	60,400	0.5	39,600	Yes	TSP, SO_2[a]	No	1.5	900,000	3.0	1,000,000
Steel Mill	VA	No	Process	1	Source	No	1	5	No	0.042	3,360	0.013	1,000	No	NA	Yes	negligible	640	0.1	5,000[d]
Electric Utility	FL	Yes	NA	4	Contractor	Yes	4	5	No	1.86	139,538	0.14	10,462	Yes	TSP, SO_2, NO_x, CO, O_3	No	2.4	280,000	4.4	430,000
Fiberglass Mfg.	IN	No	Process	1	Contractor	Yes	1	1	Yes	0.2	16,000	0.04	3,200	No	NA	Yes	negligible	600	0.25	19,800
Coal Preparation	OH	No	Process	1	Contractor	No	1	1	Yes	0.2	23,000[d]	Data not Available	Data not Available	No	NA	Yes	negligible	2,000	0.25	25,000
Chemical Processing	LA	No	Combustion	2	Contractor	No	3	21	No	0.12	10,000	0.045	3,000	No	NA	Yes	0.0[b]	0[b]	0.2	13,000
Portland Cement	TX	No	Fuel Switch	3	Contractor	No	3	20	No	0.09	7,200	0.015	1,200	No	NA	Yes	negligible	40	0.1	8,440
Compressor Station	KS	No	Combustion	1	Source	No	1	1	No	0.04	4,500	0.04	2,300	No	NA	Yes	0.0[b]	0[b]	0.2	6,800
Electric Utility	IN	No	Combustion	2	Source	No	1	11	No	0.25	20,000	0.05	4,000	Yes	TSP, CO	No	0.325	26,000[c]	0.6	50,000

[a]Three SO_2 continuous analyzers were required.

[b]Air Quality Analysis was not required because of rural location of source. $20 \mu g/m^3$ was assumed for background ambient concentration.

[c]Equipment costs were not included because source already owned monitoring equipment.

[d]EPA conducted portions of the analyses in this case.

[e]Survey indicated source chose to change stack height configuration, which required modeling to be redone 3 times. This was not required by EPA.